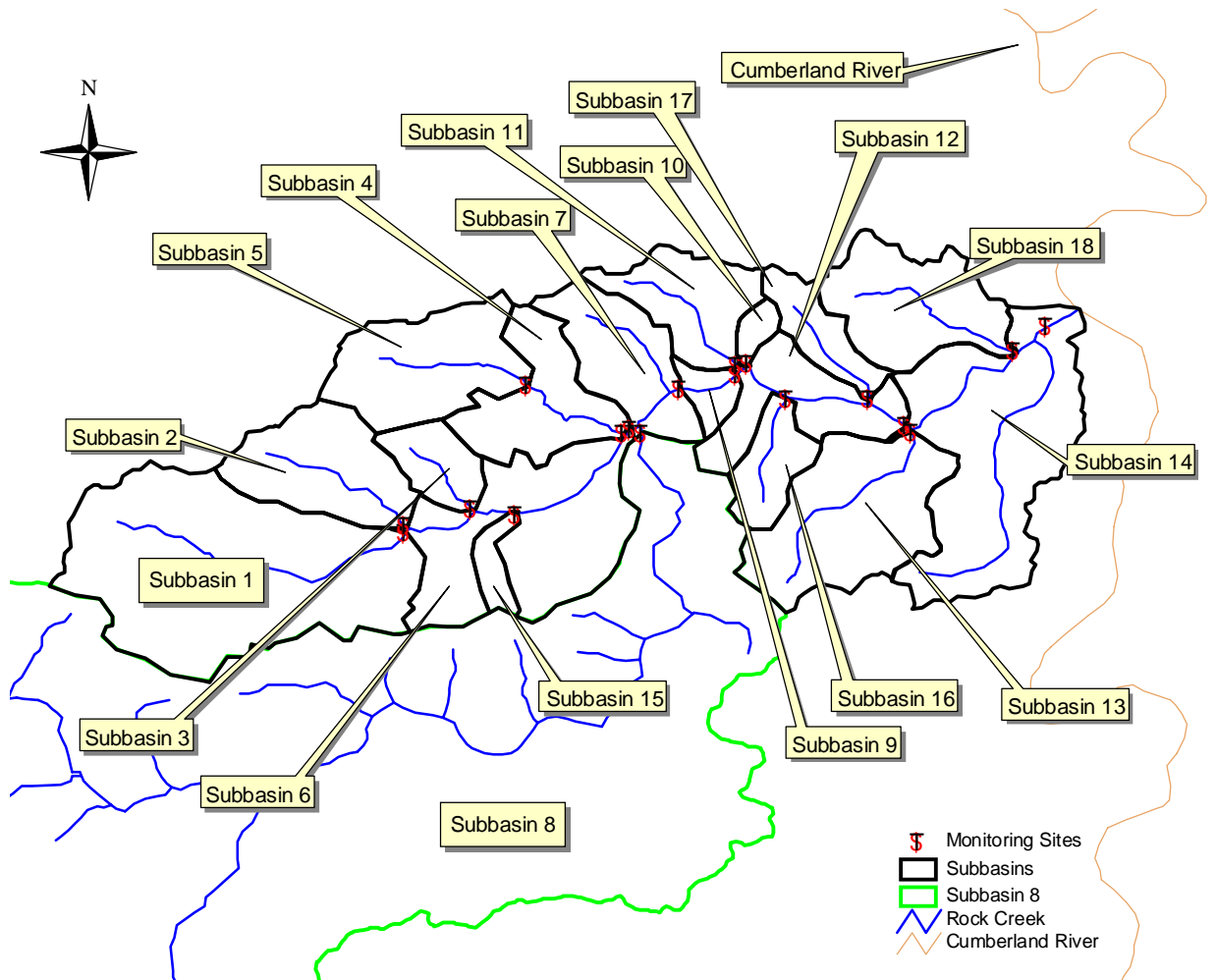


# Rock Creek of South Fork Cumberland River and White Oak Creek of Rock Creek

## Total Maximum Daily Load (TMDL) Fact Sheet

<b>Project Name:</b>	Rock Creek of South Fork Cumberland River and White Oak Creek of Rock Creek
<b>Location:</b>	McCreary County, Kentucky
<b>Scope/Size:</b>	Rock Creek, watershed 40,109 acres (62.67 mi <sup>2</sup> ) Stream Segments: Rock Creek River Mile 0.0 to 4.1 White Oak Creek River Mile 0.0 to 4.2
<b>Land Type:</b>	forest, agricultural, barren/spoil
<b>Type of Activity:</b>	acid mine drainage (AMD) caused by abandoned mines
<b>Pollutant(s):</b>	H <sup>+</sup> Ion mass, sulfuric acid
<b>TMDL Issues:</b>	Nonpoint sources
<b>Water Quality Standard/Target:</b>	pH shall not be less than six (6.0) or more than nine (9.0) and shall not fluctuate more than one and zero-tenths (1.0) pH unit over a 24-hour period. This standard is found within regulation 401 KAR 5:031.
<b>Data Sources:</b>	Kentucky Pollutant Discharge Elimination System Permit Historical Sampling Data, Murray State University Sampling Data
<b>Control Measures:</b>	Kentucky nonpoint source TMDL implementation plan, Kentucky Watershed Framework
<b>Summary:</b>	Rock Creek and White Oak Creek were determined as not supporting the designated uses of primary and secondary contact recreation (swimming and wading) and warm water aquatic habitat (aquatic life). Therefore, the creeks were placed on the 1996 and subsequent 303(d) lists for TMDL development. The creek segments are characterized by a depressed pH, the result of AMD from abandoned mining sites. In developing the TMDL for Rock Creek and White Oak Creek, pH readings and corresponding streamflow measurements were made at eighteen different locations

within the Rock Creek watershed. White Oak Creek is a tributary to Rock Creek; its subwatershed consists of Subbasins 1, 2, 3, 4, 5, 6, and 15. The most recent sampling supports the conclusion that the entire watershed (except for Sites 7, 8, and 9) has unacceptable pH levels.



Rock Creek Subbasins

**TMDL Development:**

TMDLs in grams  $H^+$  ions per day were computed based on the allowable minimum pH value of 6.0 for streams to meet primary and secondary contact recreation and aquatic life uses. The TMDL was computed in units of grams of ions (subsequently converted to lbs/day) because the units for pH do not allow for the computation of a quantitatively useful load or reduction amount.

In recognition of the inherent difficulties associated with imposition of a “no-exceedance” pH criteria on potentially intermittent streams, the Kentucky Division of Water (KDOW) has decided to use the lowest one year average discharge of the most recent 10-year flow record as the flow basis for setting the appropriate TMDL and associated loading reduction. Previous pH TMDLs have used a 3-year recurrence interval of the average flow as the critical flow. However, this flow resulted in a target discharge that frequently was significantly greater than any of the observed flows for the sites as collected over several years. Thus use of a 3-year flow would require an extrapolation of the observed ion vs. flow model, well beyond the upper limit of the observed data. The selection of the 10-year frequency was based on a consideration of water quality standards (WQSs) (i.e. 7Q10). However, since many of these streams have a 7Q10 of zero, a greater duration was needed. The consensus of the KDOW was to use the 1-year duration. The use of an average annual flow as the basis for determining the TMDL provides a more appropriate mechanism for determining: (1) the total annual load; (2) the total annual reduction that would be derived from an annual summation of the daily TMDLs; and (3) the associated daily load reductions for the critical year using historical daily flows.

**TMDL for Rock Creek:**

In developing a TMDL for Rock Creek, there are two possible strategies. Either a cumulative TMDL may be obtained for the downstream extent of the impaired portion of the watershed, or separate TMDLs (and associated load reductions) may be developed for each individual subbasin. As a result of the availability of sampling data at multiple sampling points, individual TMDLs were developed for all subbasins that were impaired because of low pH. The low pH condition extends to Site 14, which is located approximately 0.25 miles upstream from the confluence of Rock Creek with Cumberland River. The TMDLs and associated load reductions for subbasins in the Rock Creek watershed are shown below.

Summary of Flow Rate and TMDL for Each Subbasin in the Rock Creek Watershed

Subbasin	Upstream contributing area (mi <sup>2</sup> )	Incremental critical flow (cfs)	Incremental TMDL for a pH of 6.0 (lbs/day)	Predicted incremental load (lbs/day)	Load Reduction needed (lbs/day)
1	2.77	3.37	0.0182	0.0257	0.0075
2	0.88	1.07	0.0057	8.8320	8.8263
3	0.34	0.41	0.0022	0.0057	0.0035
4	0.76	0.92	0.0050	0.0000	0.0000
5	0.99	1.21	0.0065	12.5736	12.5671
6	1.49	1.81	0.0098	0.0000	0.0000
7	0.75	0.91	0.0049	0.0000	0.0000
8	48.08	58.44	0.3153	0.0442	0.0000
9	0.16	0.19	0.0010	0.0000	0.0000
10	0.10	0.12	0.0007	0.4052	0.4045
11	0.64	0.78	0.0042	3.5386	3.5344
12	0.67	0.82	0.0044	0.0000	0.0000
13	1.28	1.56	0.0084	0.1602	0.1518
14	1.96	2.39	0.0129	0.0000	0.0000
15	0.15	0.18	0.0010	0.8952	0.8942
16	0.37	0.45	0.0024	4.0309	4.0285
17	0.35	0.43	0.0023	0.3888	0.3865
18	0.91	1.11	0.0060	0.1059	0.1000
<b>Total Watershed</b>	<b>62.67</b>	<b>76.16</b>	<b>0.4100</b>	<b>31.0060</b>	<b>30.9043</b>

**Permitting in the Rock Creek Watershed:**

All of the streams in the watershed are considered to be impaired for low pH based on the available data.

**New Permits:**

New permits (except for new remaining permits) for discharges to streams in the Rock Creek Watershed could be allowed anywhere in Subbasins 1 through 18 contingent upon end-of-pipe pH permit limits in the range of 6.35 to 9.0 standard units. WQSs state that the pH value should not be less the 6.0 nor greater than 9.0 for meeting the designated uses of aquatic life and swimming. This range of 6.0 to 9.0 for pH is generally assigned as end-of-pipe effluent limits. However, because a stream impairment exists (low pH), new discharges should not cause or contribute to an existing impairment. Application of agricultural limestone on mine sites results in highly buffered water leaving the site. A buffered solution with nearly equal bicarbonate and carbonic acid components

will have a pH of 6.35 (Carew, personal communication, 2004). Discharge of this buffered solution will use up free hydrogen ions in the receiving stream, thus it should not cause or contribute to an existing low pH impairment. New permits having an effluent limit pH of 6.35 to 9.0 will not be assigned a hydrogen ion load as part of a Waste Load Allocation (WLA).

### **Remining Permits:**

Remining permits may be approved on a case-by-case basis where streams are impaired because of low pH from abandoned mines. Permit approval is contingent on reclamation of the site after mining activities are completed. Existing water quality conditions must be maintained or improved during the course of remining. The permittee is required to monitor in-stream conditions during remining to make sure that current water quality conditions are maintained or improved. Reclamation of the site is the ultimate goal, but WQSs (pH of 6.0 to 9.0 standard units) may not necessarily be met in the interim if the Commonwealth issues a variance to the discharger. In instances where the Commonwealth issues a variance for a remining activity consistent with this regulation, hydrogen ion loads from this remining activity are allowed to exceed the WLA. The variance allows an exception to the applicable WQS as well as the TMDL. Remining therefore constitutes a means whereby a previously disturbed and unreclaimed area can be reclaimed. The authority for remining is defined in Section 301(p) of the Federal Clean Water Act; Chapter 33, Section 1331(p) of the U.S. Code – Annotated (the Rahall Amendment to the Federal Clean Water Act); and the Kentucky Administrative Regulations (401 KAR 5:029 and 5:040).

The remediation of the remining site will result in a reduction of the nonpoint source ion load of the subbasin where the remining is done. When remining is completed, the remediation should result in a reduction in the load allocation. Follow-up, in-stream monitoring will need to be done at the subbasin outfall to determine the effect of reclamation activities following remining on the overall ion load coming from the subbasin. There are currently no active remining permits in the Rock Creek watershed.

**General KPDES Permit**

**for Coal Mine Discharges:** This permit covers all new and existing discharges associated with coal mine runoff. This permit does not authorize discharges that (1) are subject to an existing individual KPDES permit or application, (2) are subject to a promulgated storm water effluent guidelines or standard, (3) the Director has determined to be or may reasonably be expected to be contributed to a violation of a water of a WQS or to the impairment of a 303(d) listed water, or (4) are into a surface water that has been classified as an Exceptional or Outstanding or National Resource Water. A signed copy of a Notice of Intent (NOI) form must be submitted to the Kentucky Division of Water (KPDES Branch) when the initial application is filed with the Division of Mine Permits. However, coverage under this general permit may be denied and submittal of an application for an individual KPDES permit may be required based on a review of the NOI and/or other information.

**Antidegradation Policy:**

Kentucky's Antidegradation Policy was approved by EPA on April 12, 2005. For impaired waters, general permit coverage will not be allowed for one or more of the pollutants commonly associated with coal mining (i.e., sedimentation, solids, pH, metals, alkalinity of acidity). The individual permit process remains the same except new conditions may apply if a Total Maximum Daily Load (TMDL) has been developed and approved.

**Distribution of Load:**

Because there were no point source discharges active during the 1999-2000 monitoring period, the existing hydrogen ion load for the watershed was defined entirely as a nonpoint source load. Because new permits (pH 6.35 to 9.0) should not cause or contribute to the existing impairment and remaining permits would be exempt from the TMDL requirements, no load has been provided for the WLA category.

Wasteload and Load Allocation for Each Subbasin in the Rock Creek Watershed

	Incremental Critical Flow Rate (cfs)	TMDL for pH = 6.0 (lbs/day)	Wasteload Allocation* (lbs/day)	Load Allocation (lbs/day)
Subbasin 1	3.37	0.0182	0.00	0.0182
Subbasin 2	1.07	0.0057	0.00	0.0057
Subbasin 3	0.41	0.0022	0.00	0.0022
Subbasin 4	0.92	0.0050	0.00	0.0050
Subbasin 5	1.21	0.0065	0.00	0.0065
Subbasin 6	1.81	0.0098	0.00	0.0098
Subbasin 7	0.91	0.0049	0.00	0.0049
Subbasin 8	58.44	0.3153	0.00	0.3153
Subbasin 9	0.19	0.0010	0.00	0.0010
Subbasin 10	0.12	0.0007	0.00	0.0007
Subbasin 11	0.78	0.0042	0.00	0.0042
Subbasin 12	0.82	0.0044	0.00	0.0044
Subbasin 13	1.56	0.0084	0.00	0.0084
Subbasin 14	2.39	0.0129	0.00	0.0129
Subbasin 15	0.18	0.0010	0.00	0.0010
Subbasin 16	0.45	0.0024	0.00	0.0024
Subbasin 17	0.43	0.0023	0.00	0.0023
Subbasin 18	1.11	0.0060	0.00	0.0060

\*pH limits for new discharges must be between 6.35 and 9.0

**Implementation/**

**Remediation Strategy:**

Remediation of pH-impaired streams as a result of current mining operations is the responsibility of the mine operator. The Kentucky Division of Field Services of the Kentucky Department of Surface Mining Reclamation and Enforcement is responsible for enforcing the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The Kentucky Division of Abandoned Mine Lands (DAML) is charged with performing reclamation to address the impacts from pre-law and bond forfeiture mine sites in accordance with priorities established in SMCRA. SMCRA sets environmental problems as third in priority in the list of abandoned mine land (AML) problem types.

Reclamation projects by the Kentucky DAML are currently underway in the Rock Creek watershed. These projects were planned in two phases; Phase I and Phase II. The total construction cost of these projects is approximately \$1.4 million and the work involves installation of limestone in the watershed, excavation of coal refuse, installation of

limestone channels, installation of vertical flow systems, and reclamation of acidic refuse and landslides.

For 2000, the total federal Kentucky AML budget allocation was approximately \$17 million. However, the bulk of these funds were used to support Priority 1 (extreme danger of adverse effects to public health, safety, welfare, and property) and Priority 2 (adverse effects to public health, safety, and welfare) projects. Of the total annual federal budget allocation, AML receives only approximately \$700,000 in Appalachian Clean Streams Initiative funds, which are targeted for Priority 3 environmental problems. Based on the cost of current remediation efforts, it would appear that a significant increase in federal funding to the DAML projects, particularly Priority 3 projects, would be required in order for the AML program to play a significant part in meeting the TMDL implementation requirement associated with pH-impaired streams in the state of Kentucky.